METHYL BROMIDE CRITICAL USE RENOMINATION FOR POST-HARVEST USE TREATMENT OF STRUCTURES – FOOD PROCESSING PLANTS

NOMINATING PARTY: The United States of America

FILE NAME: USA CUN14 **POST HARVEST STRUCTURES - FOOD PROCESSING PLANTS**

BRIEF DESCRIPTIVE TITLE OF NOMINATION:
Methyl Bromide Critical Use Nomination for Post Harvest Use on Structures -- Food Processing Plants (Submitted in 2012 for 2014 Use Season)

QUANTITY OF METHYL BROMIDE REQUESTED IN EACH YEAR OF NOMINATION:

TABLE 1. QUANTITY OF METHYL BROMIDE REQUESTED IN EACH YEAR OF NOMINATION

YEAR	NOMINATION AMOUNT (KILOGRAMS)
2014	22,800 kg

(Details on this page are requested under Decision Ex. I/4(7), for posting on the Ozone Secretariat website under Decision Ex. I/4(8).)

In assessing nominations submitted in this format, TEAP and MBTOC will also refer to the original nomination on which the Party's first-year exemption was approved, as well as any supplementary information provided by the Party in relation to that original nomination. As this earlier information is retained by MBTOC, a Party need not re-submit that earlier information.

NOMINATING PARTY CONTACT DETAILS:

Contact Person:	Federico San Martini, Ph.D.
Title:	Foreign Affairs Officer
Address:	Office of Environmental Policy U.S. Department of State 2201 C Street, N.W. Room 2657 Washington, D.C. 20520 U.S.A.
Telephone:	(202) 647-3819
Fax:	(202) 647-1052
E-mail:	SanMartiniFM@state.gov

Following the requirements of Decision IX/6 paragraph (a)(1) United States of America has determined that the specific use detailed in this Critical Use Nomination is critical because the lack of availability of methyl bromide for this use would result in a significant market disruption.
■ *Yes* ☐ *No*

____________________ ____________________ __________

Signature Name Date

Title: ____________________________________

CONTACT OR EXPERT(S) FOR FURTHER TECHNICAL DETAILS:

Contact/Expert Person: Jack Housenger
Title: Division Director
Address: Biological and Economic Analysis Division
Office of Pesticide Programs
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W. Mailcode 7503P
Washington, D.C. 20460
U.S.A.
Telephone: (703) 308-8200
Fax: (703) 308-7042
E-mail: Housenger.Jack@epa.gov

LIST OF DOCUMENTS SENT TO THE OZONE SECRETARIAT IN OFFICIAL NOMINATION PACKAGE:

1. PAPER DOCUMENTS: **Title of paper documents and appendices**	**No. of pages**	**Date sent to Ozone Secretariat**
2. ELECTRONIC COPIES OF ALL PAPER DOCUMENTS: ***Title of each electronic file (for naming convention see notes above)**	**No. of kilobytes**	**Date sent to Ozone Secretariat**
USA CUN14 POST HARVEST STRUCTURES - FOOD PROCESSING PLANTS		

* Identical to paper documents

METHYL BROMIDE CRITICAL USE RENOMINATION FOR POST-HARVEST USE TREATMENT OF STRUCTURES – FOOD PROCESSING PLANTS

1. SUMMARY OF NEED FOR METHYL BROMIDE AS A CRITICAL USE

Food processing facilities in the United States have reduced the number of methyl bromide fumigations by incorporating a variety of different techniques to control pests. The most critical strategy implemented is integrated pest management (IPM), especially sanitation and equipment design modifications to enable cleaning and inspection in all areas of a facility. Facilities are being monitored for pest populations using visual inspections, pheromone traps, light traps, and electrocution traps. When insect pests are found, facilities attempt to contain the infestation with treatments of low volatility pesticides applied to both surfaces and cracks and crevices; spot treatments with heat or phosphine are used in areas that are suitable. Incoming ingredients are inspected for insect pests and may be treated with phosphine if temperature and time are sufficient, or contaminated ingredients may be rejected. These techniques do not disinfest a facility but are critical in monitoring and managing pests, and preventing pest outbreaks. However, when all these methods fail to control a pest problem, facilities must still rely on fumigation to kill insects in the processing equipment, bins, storage spaces, and even the walls of the structure. There are two primary chemical fumigants available to this industry that may accomplish these tasks: methyl bromide and sulfuryl fluoride. Sulfuryl fluoride is more sensitive to temperature and is less efficacious on insect eggs than is methyl bromide. Heat, a non-chemical option, is also used in this industry to disinfest facilities, but cannot be used in all situations (e.g., wood structures).

USG is requesting methyl bromide for this sector to allow time for the industry to purchase equipment, modify structures, and/or gain experience using alternatives.

It should be noted that in response to a petition, EPA has published a proposed order to revoke tolerances. However, sulfuryl fluoride, as ProFume®, remains registered in the U.S. for the uses described in this nomination chapter, and this nomination considers it to be a viable, available alternative. For additional information, please refer to the links on EPA's website: http://www.epa.gov/oppsrrd1/registration_review/sulfuryl-fluoride/evaluations.html.

TABLE 2. NOMINATION AMOUNT

2014 Methyl Bromide Usage Newer Numerical Index (BUNNI)					
Transition Use Reduction Description Spreadsheet					
SECTOR		**STRUCTURES**			
		Rice Millers	**Pet Food Institute**	**North American Millers**	**Sector Total**
Quantity Requested for 2013:	Amount (kgs)	2,467	4,666	18,201	25,334
Quantity Recommended by MBTOC/TEAP for 2013 :	Amount (kgs)	2,467	4,665	18,201	25,333
Quantity Approved by Parties for 2013:	Amount (kgs)	2,467	4,665	18,201	25,333
	Volume (1000 m^3)	123	259	958	-
	Rate	20	18	19	-
Transition from 2014 Baseline Adjusted Value	Percentage (%)	-10%	-10%	-10%	-
Quantity Required for 2014 Nomination:	Amount (kgs)	**2,220**	**4,199**	**16,381**	**22,800**
	Volume (1000 m^3)	**111**	**233**	**862**	**-**
	Rate	**20**	**18**	**19**	**-**

2. SUMMARIZE WHY KEY ALTERNATIVES ARE NOT FEASIBLE

This nomination is for facilities, or portions of facilities, where the use of alternatives is not technically suitable, or where the alternatives are not economically feasible. Sulfuryl fluoride is highly dependent upon temperature, so should a facility need fumigation during cold temperatures, this chemical may not be a cost-effective solution. Sulfuryl fluoride requires higher dosages for egg kill, a paramount concern in certain facilities. Phosphine can be explosive and is corrosive to many metals that are present in facilities, especially in the computers and other electronic process control instrumentation. Heat is dependent on several parameters: the structural composition, as different components expand and contract at different rates; the building design/layout factors, which affect the ability to evenly distribute heated air; and the availability of convenient and economical sources of heat. In addition, heat may not be a viable option for treatment of some food products or commodities (e.g., may cause rancidity of edible oils).

In addition, there is some confusion as to the materials that may be directly fumigated with sulfuryl fluoride. According to the Profume® label, pet food is not listed as a material approved for direct treatment. The intention of the label is to have as much product removed as possible prior to fumigation. This "incidental" fumigation has resulted in problems with label interpretation. Some companies insist that all pet food products would need to be removed from treatment areas or sufficiently protected to prevent the formation of sulfuryl fluoride residues on the pet food products. This is also a factor for mills that produce mixes (e.g., cake mixes, muffin mixes, etc.). The need to remove as much material as possible affects both the technical feasibility and the cost.

Millers have reported that tarping off-sulfuryl fluoride label ingredients and product is not practical because there could be dozens of ingredients in the facility. The ingredients and products that cannot be treated would have to be staged together in an open area in order to be covered with a tarp. The industry claims that there is not sufficient unused space in which to stage unlabeled ingredients and product during a sulfuryl fluoride fumigation.

The industry reports that complete removal of non-sulfuryl fluoride treatable ingredients and product from the target facility would present significant logistical challenges, including multiple forklifts and forklift drivers, plus rented truck trailers onto which the ingredients could be loaded. These trailers would then be removed from the facility, most likely to available space in the parking lot. A process that would add labor and trailer rental costs as well as costs associated with additional downtime needed to accomplish the ingredient removal task.

Heat is an alternative that may be used in some facilities. In addition, heat may be used in conjunction with sulfuryl fluoride. However, facilities constructed primarily from wood, about 25 percent of the flour mills in the U.S., may not be able to use heat because of warping of the wood. There is also a high initial investment to purchase equipment (heaters, fans, etc.), modify sprinkler systems, and educate personnel on heat treatments.

USG is requesting methyl bromide for this sector to allow time for the industry to purchase equipment, modify structures, and/or practice using alternatives. Although EPA has proposed to revoke the tolerances of sulfuryl fluoride (see copy of the proposed order to revoke tolerances and for additional information, please refer to the links on EPA's website: http://www.epa.gov/oppsrrd1/registration_review/sulfuryl-fluoride/evaluations.html), it remains a viable alternative and this USG nomination has considered sulfuryl fluoride to be available.

3. RESEARCH RESULTS SHOWING EFFICACY OF ALTERNATIVES

Fumigants

The 2010 MBAO presentations included reports of several structural alternatives to methyl bromide. Horn et al. (2010) presented a study on the use of a system that facilitates efficacious phosphine treatments with lower concentrations of the gas (i.e., Horn Diluphos system). By using phosphine without ammonia, using constant low concentrations of phosphine, painting exposed metals (i.e., copper and its alloys), wrapping electronic equipment in plastics, and injecting fresh air, the study Horn et al. (2010) showed that efficacious but less corrosive levels of phosphine could be maintained with their diluphos system.

Hartzer et al. (2010) compared methyl bromide, sulfuryl fluoride, and heat treatments in the Kansas State University flour mill. The efficacy results of the sulfuryl fluoride and methyl bromide treatments were not significantly different. However, the heat treatments were not as efficacious as the fumigants. There were some adult and larval survival with the heat treatment (Hartzer et al., 2010).

Arthur et al. (2010) summarized the residual efficacy of pyrethrin plus insect growth regulator aerosols on red and confused flour beetles. Confused flour beetles were less susceptible to the aerosols than were red flour beetles. The aerosol mixtures provided residual control, up to 16 weeks, for the 3% pyrethrin plus methoprene. Surface composition also affected the variation of residual control of the mixtures. The researchers found that plastic overwrap provided longer control than did paper bags. (Arthur et al., 2010)

Holcomb and McLean (2010) reported on an IPM approach in pet food processing plants and warehouses. The authors have had success in controlling pests in these facilities for over 5 years. They ensure outside sanitation around plants and warehouses. They also try to reduce introducing pests by inspecting incoming ingredients and goods to ensure they are "clean;" maintaining screens at windows and doors; and placing lights so that insects are not attracted to openings. Microsanitation and pest control access are stressed in Holcomb and McLean's (2010) IPM approach. Holcomb mentioned during his MBAO (2010) presentation that companies need to hire a sanitation team to ensure that the facility and all equipment could be thoroughly cleaned every 30 days to break the life cycle of stored product pests (which is typically about 45 days). (Holcomb and McLean, 2010)

A USDA-NIFA Methyl Bromide Transition Grant is supporting an investigation of the major pests in the rice mills, and the spatial and temporal distribution of those pests within the rice mill. The results thus far have determined that the red flour beetle is the major pest. Preliminary investigation has shown that similar to flour mills, the populations inside a mill are higher when outside populations are higher. The focus is to develop an integrated pest management program and to determine the impact of sanitation on residual insecticides. This multiyear investigation also includes economic costs of control, and will incorporate information into the existing web-based management system. (Arthur et al., 2011a)

Further investigations into aerosol treatments in sheds demonstrated some variation. In one test block, adult red flour beetles stayed in food patches, but in another block, adults moved more and had little development in the food patches. When adults were active, higher efficacy of aerosol applications occurred as evidenced by trap catch and dead insects. This was not the case when adults were not active. Authors intend to study further for explanations. Future tests also include trying to understand movement patterns; synergized pyrethrins and methoprene and using a series of covers for the food patches; and new foggers. In addition to those shed tests, more trials in the field are being planned. (Arthur et al., 2011b)

4. ECONOMIC IMPACTS

TABLE 3. ECONOMIC SUMMARY FOR EACH ALTERNATIVE

METHYL BROMIDE ALTERNATIVE	ECONOMIC SUMMARY
HEAT TREATMENT	For most facilities, i.e., those not constructed primarily of wood, it is feasible to switch to heat treatments. Some facilities experience better insect control with heat than fumigation due to leaky structures that allow gas to escape.
SULFURYL FLUORIDE	Sulfuryl fluoride is an economically viable option for most food processing facilities. Exceptions include facilities that manufacture products not on the ProFume® label, e.g., cake mixes, pet food facilities.

Two economic analyses were conducted – one for pet food facilities, and one for mills and other food processing facilities. Pet food facilities are conducted separately because the industry supplied its own revenue data. For other facilities, the available data were a budget for a 500,000 cubic foot flour mill.

It is important to note that sulfuryl fluoride is only considered to be technically feasible in facilities that do not prepare mixed products (e.g., cake mixes) due to labeling.

Pet Food Facilities

Many pet food manufacturing and storage facilities have converted to alternatives; the Pet Food Institute (PFI) estimates that less than 10 percent of pet food manufacturing facilities, generally older facilities, still use methyl bromide. In previous analyses (e.g., Ranville and Cook, 2011), the Agency has assumed that no additional days of downtime are necessary for heat treatment based on published estimates of time for heating a facility (e.g., Beckett et al., 2007). Although it could take slightly longer in some cases to conduct heat disinfestation of an entire facility than it would to conduct MeBr disinfestation, heat has the advantage of being safe to use in parts of the facility while the facility is still operating, a situation which would not be possible with chemical fumigants due to the possibility of chemical exposure. Based on the available information, additional days of downtime were not factored into the economic analysis of transition to heat. EPA used information obtained on the costs of heat treatment when a facility opts to purchase its own equipment (e.g., heaters, fans, ductwork, etc.). These costs are not industry specific.

Table 4 displays the results of the economic analysis of transition to heat for a 28,300 cubic meter (1 million cubic foot) mill, the average size pet food mill according to the application. Cost information from Adam et al. (2010) was used for the analysis to reflect the average plant in the pet food industry. Percent change in gross revenue was used to compare heat disinfestation when a facility uses its own equipment with methyl bromide disinfestation. The first heat column reflects the cost of treatment plus the annualized cost of heating equipment (e.g., heaters, fans, ductwork, etc.) over ten years. The second heat column displays the cost of treatment only that would apply after heating equipment was purchased.

Table 4. Analysis of transition to heat treatments for pet food facilities [1]

	Methyl Bromide	Heat (purchase own equipment)	Heat (purchase own equipment, post initial investment period)
Size of facility to be treated (cu m)	28,300	28,300	28,300
Total Revenues/Sales [2]	$ 33,176,000	$ 33,176,000	$ 33,176,000
Cost of Disinfestation [3, 4]	$ 37,700	$ 55,600	$ 30,700
Change in cost from MeBr to alternative		$ 17,900	$ -7,000
% change in gross revenue from MeBr		-0.05%	0.02%

[1] Numbers may not add due to rounding; all figures are rounded to the nearest hundred.
[2] Revenues are estimated at $116,000 per day times 5.5 operating days per week or 286 operating days per year.
[3] Disinfestation costs for methyl bromide based on figures from Adam et al. (2010), adjusted for changes in price of gas. Analysis assumes two MeBr fumigations per year. Assumes gas price of approximately $33.00 per kg ($15.00 per lb) and application rates of approximately 15.4 g/cu m (0.96 lbs/cu ft) for methyl bromide.
[4] Costs of heating equipment and energy needed to run heaters from TempAir. Analysis assumes three heat treatments per year. The first heat column assumes the facility is in an initial ten year investment phase when it is paying for the heaters and the cost of energy and materials for fumigation. Initial cost of heaters for a 28,300 cubic meter facility is approximately $249,000, or $14,900 spread over ten years. The cost of energy and materials for each fumigation of a 28,300 cubic meter facility is approximately $10,229 after the initial investment period in the heaters.

Mills and Other Food Processing Facilities

Revenue data for flour mills were available in a sample budget; revenue data specific to rice mills were not publicly available, so the available data for the sample flour mill were used to estimate impact for both types of mills as well as other food processing facilities.

Two alternatives were considered for mills – sulfuryl fluoride and heat treatments. An average application rate of 1.35 lbs/1,000 cu ft (21.6 g/ cu m) was assumed for methyl bromide and 2.5 lbs/1,000 cu ft (40.0 g/cu m) was assumed for sulfuryl fluoride. The two heat scenarios compared were contract service or a pay per treatment where the facility does not purchase its own equipment and a scenario, similar to pet food facilities, where the mills purchase their own equipment. A cost of $80/1,000 cu ft was used for the estimate of heat under a pay-per-treatment scenario. The same estimates used for pet food facilities were used in the mills analysis, but the investment period was stretched over twenty years.

Sample revenue and cost data were available for a 14,200 cubic meter (500,000 cubic foot) flour mill, so the analysis was based on this information. Table 5 displays the economic analysis of transition to sulfuryl fluoride and heat from methyl bromide.

Table 5. Analysis of transition to alternatives for mills and other food processors [1]

	Methyl Bromide	Sulfuryl Fluoride	Heat (pay per treatment)[6]	Heat (purchase equipment)[7]
Size of facility to be treated (cu m)	14,200	14, 200	14, 200	14, 200
Total Revenues/Sales [2]	$ 32,277,000	$ 32,277,000	$ 32,277,000	$ 32,277,000
Operating Costs	$ 28,281,000	$ 28,281,600	$ 28,326,200	$ 28,269,700
Annual Cost of Disinfestation [3]	$ 34,900	$ 35,400	$ 80,000	$ 23,600
Total cost of gas per treatment ($)	$ 10,104	$ 9,355	na	Na
Price of fumigant gas ($/kg) [4]	$ 33.00	$ 16.50	na	Na
Gas needed per fumigation (kgs) [5]	306	567	na	Na
Total application costs /treatment ($)	$ 7,300	$ 8,300	$ 40,000	$ 11,800
Cost of application ($/1,000 cu m)	$ 518	$ 590	$ 2,825	Na
Net Revenue	$ 3,996,000	$ 3,995,500	$ 3,950,900	$ 4,007,300
Change in cost from MeBr to alternative		$ 500	$ 45,100	$ (11,300)
% change in net revenue from MeBr		-0.01%	-1.13%	0.28%

[1] Numbers may not add due to rounding; some figures are rounded to the nearest hundred.
[2] Revenues from sample budget (Kenkel and Holcomb, 2004); 10-year avg, rounded to nearest hundred.
[3] Disinfestation costs for methyl bromide and sulfuryl fluoride, except for fumigant gas prices, based on figures from Adam et al. (2010), adjusted for changes in size of facility. Analysis assumes two fumigations per year for methyl bromide and sulfuryl fluoride, and two heat treatments.
[4] Assumes gas price of $33.00 per kg ($15.00 per lb) for methyl bromide and $16.50 per kg ($7.50 per lb) for sulfuryl fluoride.
[5] Assumes application rates of 21.6 g/cu m (1.35 lbs/1,000 cu ft) for methyl bromide and 40 g/cu m (2.5 lbs/1,000 cu ft) for sulfuryl fluoride.
[6] This column displays heat costs based on the assumption that the mill purchases heat treatment service and does not purchase its own equipment. The price is an average of estimates provided in the rice and flour mills CUE applications.
[7] This column displays heat costs based on the assumption that the mill purchases its own heaters and other necessary equipment. The application costs per treatment include the cost of heaters, fans, sensors, ductwork, and natural gas. A usable life of 20 years is assumed for the heaters and fans to calculate an annual cost average. Raw cost estimates were provided by TempAir in 2010.

CONCLUSION

This nomination is for facilities, or portions of facilities, where the use of alternatives is not technically suitable or where the alternatives are not economically feasible. Sulfuryl fluoride requires higher dosages for egg kill, a paramount concern in certain facilities. Heat is dependent on several parameters: the structural composition, as different components expand and contract at different rates; the building design/layout factors, which affect the ability to evenly distribute heated air; and the availability of convenient and economical sources of heat.

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CITATIONS

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